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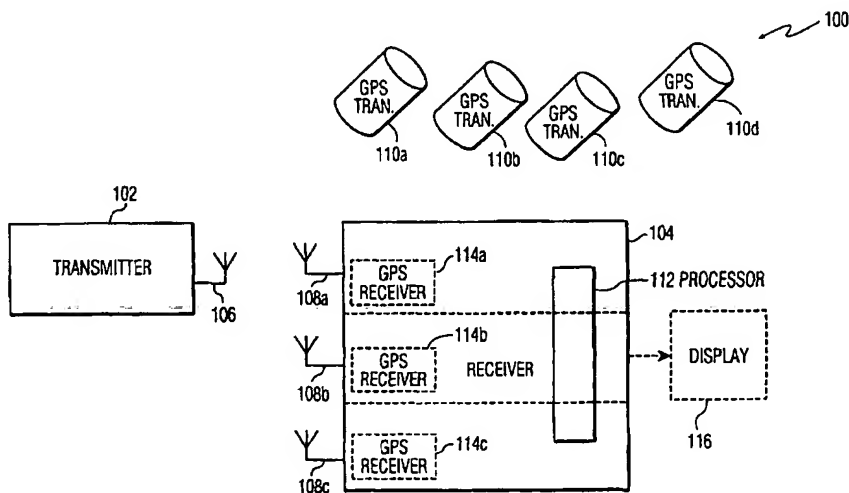
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(54) Title: USING MULTIPLE RECEIVE ANTENNAS TO DETERMINE THE LOCATION OF A TRANSMITTER WITH RESPECT TO A RECEIVER IN ULTRA WIDEBAND SYSTEMS



(57) Abstract: An apparatus, system, method, and computer program product for determining a location of at least an image of a transmitter transmitting a signal is disclosed. The location of at least the image of the transmitter is determined by receiving a signal transmitted by the transmitter at at least three receiver antennas separated by known distances. Differences in time are then determined between receipt of the signal at one of the receiver antennas and at least two other receiver antennas. The known distances and the determined differences in receipt times are then processed to determine the location of the transmitter.

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B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 G01S H04Q				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ, INSPEC				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 2002/145564 A1 (ANDERSON ROBERT J ET AL) 10 October 2002 (2002-10-10) abstract paragraphs '0049! - '0053! paragraph '0185! paragraph '0205! paragraphs '0209! - '0219! paragraphs '0302!, '0303! ----- -/--	1-3, 8-12, 17-21, 23-26, 28-30, 32		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.				
* Special categories of cited documents: <table border="0"> <tr> <td> *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed </td> <td> *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *Z* document member of the same patent family </td> </tr> </table>			*A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *Z* document member of the same patent family
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/40224

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 446 701 A (VAN DE LOO DALE P ET AL) 29 August 1995 (1995-08-29)</p> <p>abstract figure 6b column 3, line 41 - column 4, line 22 column 8, line 37 - column 9, line 16 -----</p>	<p>1,3,5,6, 10,12, 14,15, 19,21, 24,26,29</p>
X	<p>US 6 054 950 A (FONTANA ROBERT J) 25 April 2000 (2000-04-25)</p> <p>abstract column 3, line 6 - line 63 column 7, line 17 - line 34 -----</p>	<p>1,4,8, 10,13, 17,19, 22-24, 27-29, 31,32</p>
X	<p>US 6 300 904 B1 (DVORAK MARK D ET AL) 9 October 2001 (2001-10-09)</p> <p>abstract column 1, line 13 - column 2, line 67 -----</p>	<p>1,7,10, 16,19, 24,29</p>

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/40224

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2002145564	A1	10-10-2002	US 6400320 B1	04-06-2002
			US 6184829 B1	06-02-2001
			US 2002101375 A1	01-08-2002
			US 2002080069 A1	27-06-2002
			US 2003095069 A1	22-05-2003
			US 2002186167 A1	12-12-2002
			US 2003016174 A1	23-01-2003
			US 2004017312 A1	29-01-2004
			AU 1938800 A	24-07-2000
			AU 2051300 A	24-07-2000
			AU 2359000 A	24-07-2000
			AU 2359100 A	24-07-2000
			AU 2359200 A	24-07-2000
			AU 3119300 A	24-07-2000
			AU 3119400 A	24-07-2000
			AU 3120500 A	24-07-2000
			BR 9917164 A	22-01-2002
			BR 9917165 A	22-01-2002
			BR 9917166 A	09-04-2002
			CA 2359797 A1	13-07-2000
			CA 2360130 A1	13-07-2000
			CA 2360136 A1	13-07-2000
			CN 1333877 T	30-01-2002
			CN 1333876 T	30-01-2002
			CN 1333878 T	30-01-2002
			EP 1145034 A1	17-10-2001
			EP 1145036 A1	17-10-2001
			EP 1145032 A2	17-10-2001
			GB 2363293 A ,B	12-12-2001
			GB 2362530 A ,B	21-11-2001
			GB 2362072 A ,B	07-11-2001
			GB 2387084 A ,B	01-10-2003
			JP 2002534688 T	15-10-2002
			JP 2002534689 T	15-10-2002
			JP 2002534695 T	15-10-2002
			WO 0040991 A1	13-07-2000
			WO 0040993 A1	13-07-2000
			WO 0041417 A1	13-07-2000
			WO 0041402 A2	13-07-2000
			WO 0041403 A2	13-07-2000
			WO 0041404 A2	13-07-2000
			WO 0040992 A1	13-07-2000
			WO 0041319 A2	13-07-2000
			US 2002172223 A1	21-11-2002
			US 6266013 B1	24-07-2001
			US 6091362 A	18-07-2000
			US 6097336 A	01-08-2000
			US 6172644 B1	09-01-2001
US 5446701	A	29-08-1995	US 5346210 A	13-09-1994
			AU 4479693 A	03-03-1994
			CA 2104938 A1	01-03-1994
			EP 0585101 A2	02-03-1994
US 6054950	A	25-04-2000	NONE	
US 6300904	B1	09-10-2001	AT 265052 T	15-05-2004
			AU 5329500 A	28-12-2000

Form PCT/ISA/210 (patent family annex) (January 2004)

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/40224

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6300904	B1	CA 2375452 A1	14-12-2000
		DE 60010077 D1	27-05-2004
		EP 1188066 A1	20-03-2002
		JP 2003501664 T	14-01-2003
		WO 0075681 A1	14-12-2000